REMARKS

Applicants have amended their claims in order to further clarify the definition of various aspects of the present invention. Specifically, Applicants have cancelled claims 1-12, 22, 23 and 25-31 without prejudice or disclaimer, and, in particular, without prejudice to the filing of a Continuing application or applications directed to the subject matter thereof. Moreover, Applicants have amended claims 13-15 and 18 to recite that the graphite powder of the negative electrode has a particle size equal to or smaller than 100 μm. Note, for example, previously considered claim 24. Applicants have also amended claim 19 to correct the dimensions in the last line thereof, and to recite that the negative electrode includes carbon material as an active material; and have amended claim 20 to delete the recitation concerning the graphite powder at lines 8-10 of original claim 20, further amending claim 20 to re-insert particle size of the graphite powder.

Applicants are adding claims 32 and 33 to the application. Claims 32 and 33, dependent respectively on claims 13 and 20, recite that the graphite powder includes at least a fraction having hexagonal crystal structure.

The objection to claim 19 because of "incorrect labeling units found in the last line of this claim" is moot, in light of present amendments to claim 19.

Rejection of claims 20-23 under the second paragraph of 35 USC §112, as being indefinite, set forth in Item 4 on page 2 of the Office Action mailed November 5, 2003, is moot in light of present amendments to claim 20, and in light of present canceling of claim 22 without prejudice or disclaimer. That is, claim 20 as presently amended omits the prior recitation, in original claim 20 of "said" graphite powder (note lines 8-10 of original claim 20); and claim 20 now recites that the negative electrode includes graphite powder having specific characteristics including

particle size. Particularly by deleting lines 8-10 of original claim 20, questions concerning antecedent basis for "said graphite powder" in line 8 of original claim 20, is moot.

Applicants respectfully submit that all of the claims remaining in the above-identified application patentably distinguish over the teachings of the references applied by the Examiner in rejecting claims in the Office Action mailed November 5, 2003, that is, the teachings of the U.S. Patents to Flandrois, et al., No. 5,554,462, and to Takami, et al., No. 5,340,670, under the provisions of 35 USC §102 and 35 USC §103.

Initially, attention is respectfully directed to the rejection of claims over the teachings of Flandrois, et al., as set forth in Item 7 on page 3 of the Office Action mailed November 5, 2003. Only claims 13-16 and 18 were rejected in view of the teachings of Flandrois, et al. Comparing, for example, claims 17 and 18, claim 17 as previously considered by the Examiner recited that the graphite crystal powder has a particle size equal to or smaller than 100 μm, while claim 18 did not recite a particle size of the graphite crystal powder. Again, it is emphasized that claim 17 was not rejected over the teachings of Flandrois, et al., while claim 18 was so rejected. Claim 16 has been cancelled by the present amendments, without prejudice or disclaimer; and claims 13-15 and 18 have been amended to recite the particle size of the powder. For this reason alone, it is respectfully submitted that the prior art rejection over the teachings of Flandrois, et al. is moot.

In any event, note that Flandrois, et al. discloses a carbon anode for a lithium rechargeable electrochemical cell, the anode including a graphite-containing, carbon-containing material, characterized in that the material includes, prior to electrical cycling, at least a first phase constituted by graphite having a

rhombohedral crystal structure and including a fraction of more than 10%. See column 2, lines 3-10. In a variant as disclosed in this patent, the anode includes a carbon-containing material that also includes a second phase constituted by graphite having a hexagonal crystal structure, the rhombohedral phase fraction being defined as set forth in column 2, lines 38 and 39. Note, for example, column 2, lines 33-40. See also column 3, lines 30-38; and column 5, lines 61-66.

As can be seen in the foregoing, Flandrois, et al. is primarily concerned with providing an anode having at least a certain percentage of rhombohedral crystal structure of the carbon anode. It is respectfully submitted that this patent does not disclose, nor would have suggested, an electrode or non-aqueous secondary battery as in the present claims, including at least a fraction, and especially relatively large amounts, of hexagonal crystal structure, for the graphite powder of the negative electrode, and wherein the graphite powder has a particle size equal to or smaller than 100 μm.

As for the remaining rejection of claims, over the teachings of U.S. Patent No. 5,340,670 to Takami, et al., as set forth in Item 6 bridging pages 2 and 3 of the Office Action mailed November 5, 2003, it is respectfully submitted that the teachings of this applied reference would have neither disclosed nor would have suggested such a non-aqueous secondary battery as in the present claims, or such electrode for a non-aqueous secondary battery as in the present claims, including a negative electrode comprising graphite powder having a rhombohedral crystal structure in a range of 0-20% by weight (that is, a relatively small amount of rhombohedral crystal structure) and a particle size equal to or smaller than 100 μm (see claims 13 and 20); or wherein the negative electrode includes graphite powder having at least a fraction of a hexagonal crystal structure and 0-20% by weight rhombohedral crystal structure

(Claims 32 and 33), more particularly an existing ratio of the hexagonal crystal structure in the graphite being at least 80% by weight (see claims 14, 15, 17-19 and 21), with a particle size of the graphite powder being equal to or smaller than 100 μm.

Moreover, it is respectfully submitted that the teachings of this applied reference would have neither disclosed nor would have suggested such electrode as in the present claims, having the graphite crystal powder of crystal structure and particle size as discussed previously, and wherein the crystal powder has a deintercalating capacity for lithium of at least 320 mAh/g.

The present invention is directed to a non-aqueous secondary battery using a negative electrode made of graphite powder, as well as to such negative electrode of graphite powder. The present invention has use, for example, in connection with a lithium battery, and provides such battery which can have an high energy density and a long life, and which has excellent intercalation capacity (that is, an increased capacity of the battery).

Carbon material has been proposed as the negative electrode active material, in place of lithium metal, in lithium batteries, in which charge and discharge reactions involving lithium ion intercalation into the carbon material and deintercalation from the carbon material occur. However, in previously proposed batteries (e.g., lithium batteries) using carbon material as active material for the negative electrode, a large capacity cannot be obtained; and, moreover, preferable performances of rapid charging and discharging are not obtained. Note the paragraph bridging pages 2 and 3 of Applicants' specification.

Against this background, Applicants provide a negative electrode using carbon powder as active material, which active material has good charging and

discharging characteristics, while having a large capacity (large intercalation capacity). Applicants have found that by using graphite powder having hexagonal crystal structure; and, in particular, by limiting the amount of rhombohedral crystal structure of the graphite powder, and increasing the amount of graphite powder having hexagonal crystal structure, various advantages are achieved. In particular, by reducing the graphite powder having rhombohedral crystal structure and using graphite powder having hexagonal crystal structure, intercalation capacity of the negative electrode is increased. That is, the number of storage sites for lithium anodes in the negative electrode is increased.

In accordance with the present invention, graphite is used as material for the negative electrode, and a focus thereof is on its crystallinity. That is, Applicants have found that by using graphite powder having hexagonal crystal structure, and, in particular, by using graphite powder having a specific ratio of hexagonal crystal to rhombohedral crystal, of the negative electrode, improvements in capacity are achieved. Using hexagonal crystal structure, and, in particular, a minimum of hexagonal crystal structure relative to rhombohedral crystal structure, unexpectedly better results of improved capacity are achieved, for the electrode and battery of the present invention.

It is emphasized that according to the present invention, Applicants limit the amount of rhombohedral structure, according to an aspect of the present invention; and, moreover, Applicants use graphite powder having hexagonal crystal structure, according to aspects, so as to achieve advantages according to the present invention.

Takami, et al. discloses a negative electrode carbonaceous material suitable for a lithium secondary battery, as well as a battery for using this negative electrode

carbonaceous material. According to various aspects in Takami, et al., the negative electrode contains a carbonaceous material which has an exothermic peak at 700°C or more when measured by a differential thermal analysis; an intensity ratio P_{101}/P_{100} of a (101) diffraction peak P_{101} to a (100) diffraction peak P_{100} of a graphite structure, obtained by X-ray diffraction analysis, of 0.7 to 2.2; and absorbs and desorbs lithium ions. See column 3, lines 1-8. Other negative electrodes disclosed in Takami, et al., as part of the described invention therein, are described at column 3, lines 16-25, 38-44, and 56-60 and 66-68; as well as in column 4, lines 9-13, 17 and 18. Note also column 20, lines 25-56; column 21, lines 3-22; column 22, lines 1-19 and 37-62; and column 23, lines 10-21, for other disclosures in connection with negative electrodes of the secondary battery of Takami, et al. These disclosures all refer to the carbonaceous material having a graphite structure that exhibits a property of allowing easy reversible absorption and desorption of lithium ions to and from between hexagonal-net-plane layers in the graphite structure. Note also, for example, Example 1 in column 24, and particularly lines 23-29 thereof, disclosing that the carbonaceous material used was a graphitized carbon powder with an average particle size of 25 μm, which was distributed at a ratio of 90 vol % within the range of 1-50 μm in a particle size distribution, and in which the ratio of particles with a particle size of 0.5 μm or less was 0 vol % in the particle size distribution. Note also, inter alia, Example 2 and the description in connection therewith at column 25, lines 20-26; and Example 3 and the discussion in connection therewith at column 25, lines 53-59, describing particle size of the carbonaceous material.

It is respectfully submitted that Takami, et al. discloses structure having hexagonal-net-plane layers. It is respectfully submitted that this disclosure would have neither taught nor would have suggested the hexagonal crystal structure, or the

recited amount (especially maximum amount) of rhombohedral crystal structure as in the present claims, much less amount of hexagonal crystal structure as in the present claims.

The contention by the Examiner in the first paragraph on page 3 of the Office Action mailed November 5, 2003, that Takami, et al. "specifically recites the hexagonal crystal structure of the graphite negative electrode" is respectfully traversed. It is respectfully submitted that Takami, et al. discloses hexagonal-net-plane layers, which is different from a hexagonal crystal structure. It is respectfully submitted that the hexagonal-net-plane layers means a laminated condition of each of carbon sheets which composes the graphite, and that such expression of hexagonal-net-plane layers would have neither disclosed nor would have suggested the presently claimed structure, including the graphite powder having a maximum amount of rhombohedral crystal structure and/or having hexagonal crystal structure, much less amount of the hexagonal crystal structure.

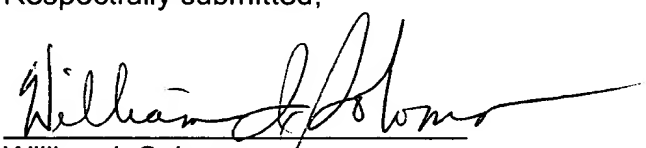
To the contrary, it is respectfully submitted that Takami, et al. specifically disclose a structure which does not have a high crystallinity, describing structure with minimum twisted structures and defects existing between layers of the hexagonal-net-plane layers, see column 7, lines 29-40.

It is respectfully submitted that the subject matter according to the present invention has relatively high crystallinity, in contrast to the carbon material in Takami, et al. having a low crystallinity with layers stacked in the graphite structure having displacements twists and angles relative to one another. Clearly, Takami, et al. would have neither taught nor would have suggested the present invention.

In view of the foregoing comments and amendments, reconsideration and allowance of all claims presently in the application are respectfully requested.

To the extent necessary, Applicants petition for an extension of time under 37 CFR §1.136. Please charge any shortage in the fees due in connection with the filing of this paper, including extension of time fees, to Deposit Account No. 01-2135 (Case No.: 503.34465VV4), and please credit any excess fees to such deposit account.

Respectfully submitted,



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